ETSI IoT week

Session: IoT activities in India

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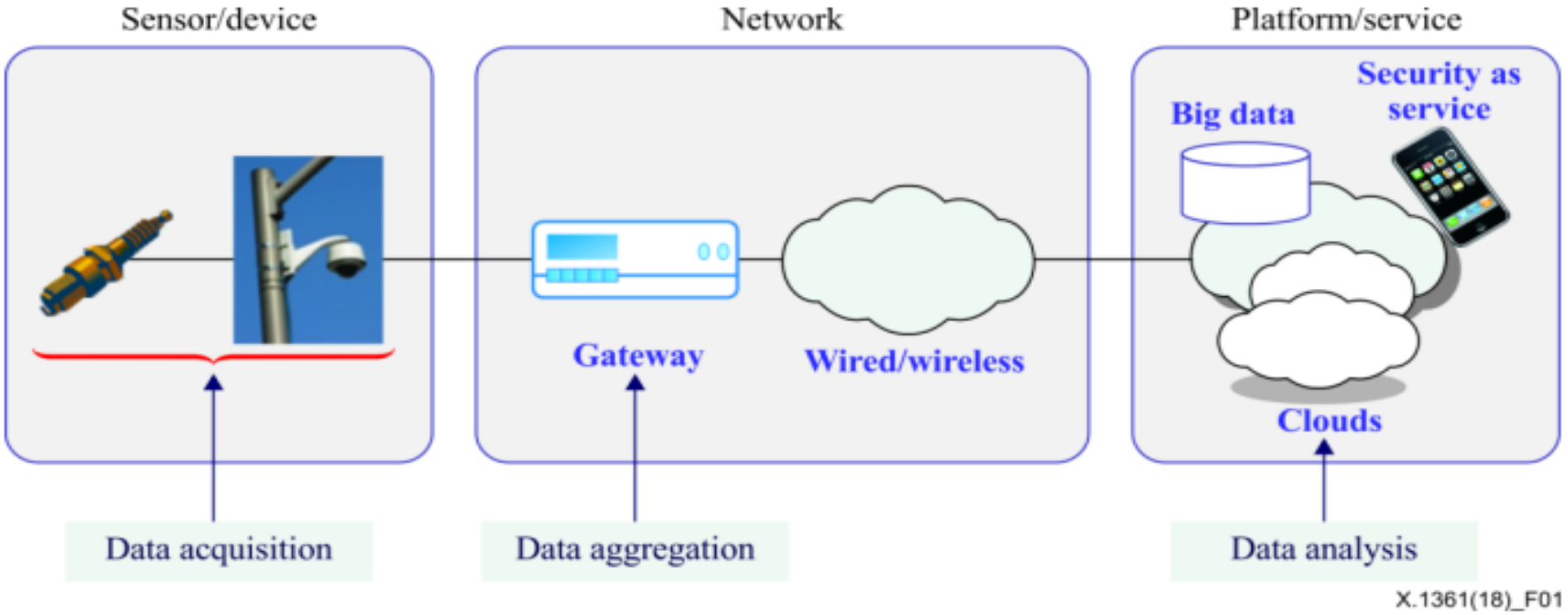
Telecommunication Engineering Centre (TEC)

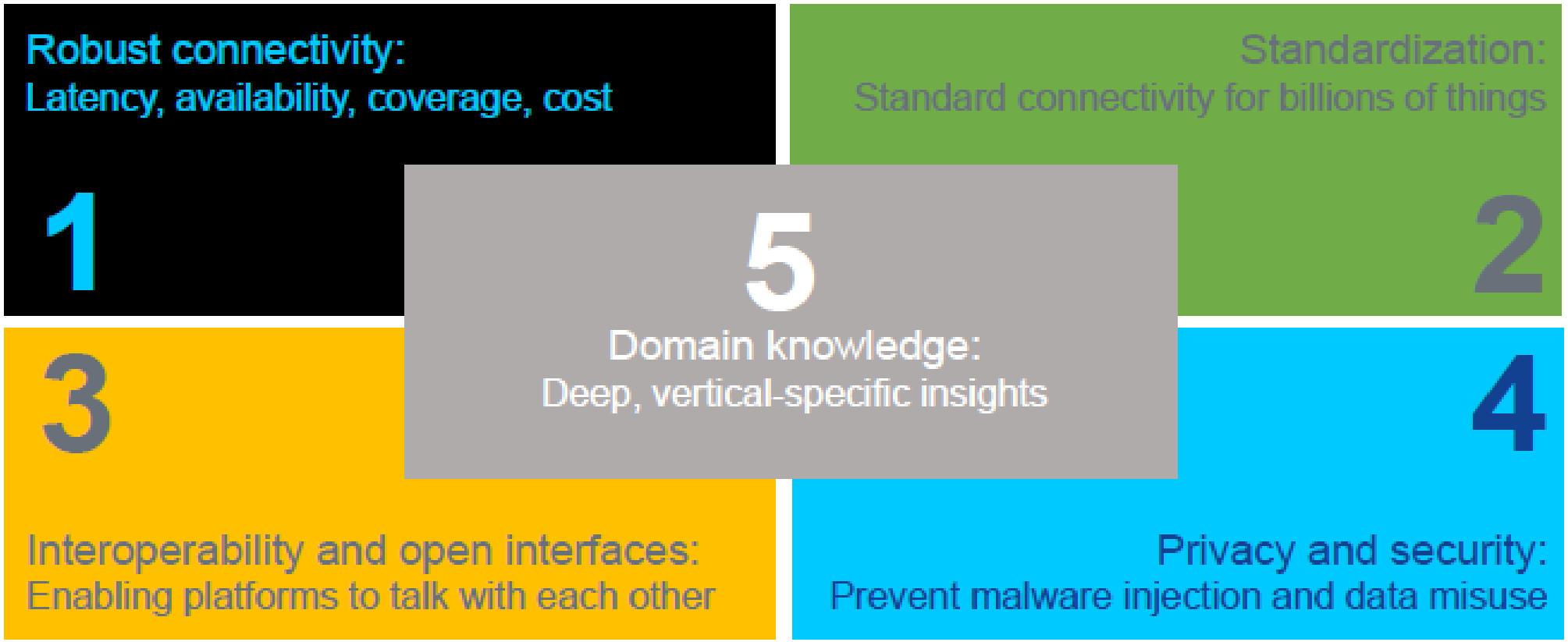
- National Standards Body (NSB) for Telecom & related ICT sector
- Designated National Enquiry point for WTO –TBT (Technical Barrier to Trade) for telecom sector.
- Mandated to coordinate with ITU-T and having National Working Groups (NWGs) in line with ITU-T Study Groups (11 study groups). DoT is the nodal agency for coordinating with ITU from India.
- Designated authority to implement Mandatory Testing & Certification of Telecom Equipment (MTCTE)
- Designated authority to accredit the CABs (Conformity assessment bodies)
- Also participating in ETSI, oneM2M, 3GPP standardisation activities at global level; and in TSDSI and BIS in India.

IoT functional architecture



- **ITU** has defined Internet of Things (IoT) "As a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving **interoperable information and communication technologies**".
  [Source: ITU-T Y.2060 (06/2012)]

Five main challenges have to be overcome for IoT



IoT standardization activities and progress, ITU, Oct 2017

Nearly 40% of the economic impact of IoT requires interoperability between IoT systems.

Smart Cities as super application domain of IoT

Integration of multiple verticals

Citizen-centric services

Still a number of technical challenges, incl. interoperability, scalability, dynamicity, security and privacy

The brain of the city

Data collection, analysis, knowledge, planning, action

The senses of the city

City data sources

Source: Dr. Levent Gürgen

Policy initiatives for of M2M/ IoT & 5G in India

1. Important policy points released by Department of Telecom (DoT)

- **National Digital Communication Policy (NDCP)-2018** released in 2018 having salient features:
  - Secure & Sustainable eco-system development for massive scale of **5 billion connected devices,**
  - Creation of innovation led Start-ups in Digital Communications sector
  - Creating a roadmap for emerging technologies and its use in the communications sector, such as **5G, Artificial Intelligence, Robotics, Internet of Things, Cloud Computing and M2M**
  - Establish a multi-stakeholder led collaborative mechanism for coordinating transition to **Industry 4.0**
  - Developing market for IoT/ M2M connectivity services in sectors including **Agriculture, Smart Cities, Intelligent Transport Networks, Multimodal Logistics, Smart Electricity Meter, Consumer Durables** etc. incorporating international best practices

Policy initiatives for of M2M/ IoT & 5G in India

- Promoting research & development in Digital Communication Technologies by creating a framework for testing and certification of new products and services

- National Telecom M2M Roadmap released in 2015.
- M2M Service provider registration policy released in Feb 2022: M2M/ IoT Service providers should register on DoT portal.
- Production Linked Incentive (PLI) scheme for Promoting Telecom & Networking Products Manufacturing in India
- Telecom Technology development fund (TTDF) launched for indigenous development of technologies.
- Bharat 6G Alliance launched recently.

2. Ministry of Electronics & information technology (MeitY) released the policies on semiconductor development, electronics manufacturing etc.

Standards Development

- TEC, BIS and TSDSI are working in the development of standards in collaboration with the international SDOs.
- TEC is having National Working Groups (NWGs) as a mirror committees of ITU-T Study Groups (SGs).
- BIS national committees are inline with ISO/ IEC
- TEC through public consultation adopted 3GPP and oneM2M specification (transposed by TSDSI) as national standards. It will help in the development of standards based eco system in the country.
    - oneM2M Release 2 and Release 3 standards adopted as National Standard
    - 3GPP specifications adopted as National Standard
    - 5Gi specifications developed by TSDSI merged with 3GPP Release 17.

- **Related to IoT and Smart City Standardisation activities**

  Participating in the meetings of ITU-T SG-20, ITU-T SG-17, ITU-R WP 5D, ITU-T FG AI4A, ISO/ IEC JTC1 SC41, ETSI IoT week / Security weeks, oneM2M, 3GPP, NIST etc. at international level; and in Bureau of Indian Standards (BIS) & Telecom Standards Development Society of India (TSDSI) at National level.

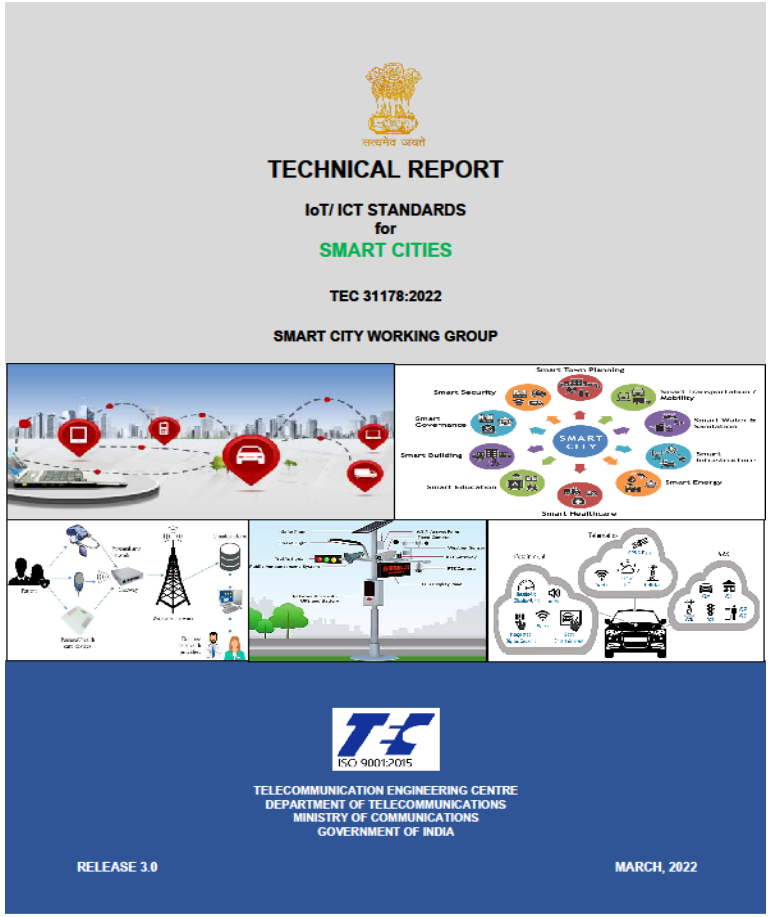
TEC initiatives in M2M/ IoT domain

ISO 9001:2015

- TEC started working in M2M/ IoT domain since 2014.
- TEC formed multi-stake holders working groups to study M2M/ IoT domain, having members from **academia, industries, start up, SDOs, Government etc**. Through these studies, released 19 Technical Reports with the outcome intended to be used in policy/ standards.
- *Total members of all working groups taking together may be around 150.*

1. M2M Enablement in **Power Sector**
2. M2M Enablement in **Intelligent Transport System**
3. M2M Enablement in **Remote Health Management**
4. M2M Enablement in **Safety & Surveillance Systems**
5. M2M **Gateway & Architecture**
6. M2M **Number resource requirement** and options
7. **V2V / V2I Radio Communication** and **Embedded SIM**
8. **Spectrum requirements for PLC** and **Low Power RF Communications**.
9. ICT Deployments and strategies for India's **Smart Cities**: A curtain raiser

TEC initiatives in M2M/ IoT domain



10. M2M/ IoT Enablement in **Smart Homes**
11. **Communication Technologies** in M2M / IoT domain
12. Design and Planning **Smart Cities** with IoT/ ICT
13. M2M/ IoT **Security**
14. IoT/ICT Enablement in **Smart Village & Agriculture**
15. Code of practice for **Securing Consumer IoT**
16. **Emerging Communication Technologies** and Use cases in IoT domain
17. IoT/ ICT Standards for **Smart Cities**
18. Framework of **National Trust Centre for M2M/IoT Devices and Applications**
19. **Security by design for IoT device manufacturers**

➢ ***TEC Initiatives in M2M/ IoT Domain- An overview***

https://tec.gov.in/M2M-IoT-technical-reports

TEC Initiatives in M2M/ IoT domain

➢ **Important outcomes** of these technical reports are the part of policies/ standard. Few are as listed below:

- 13 digit numbering scheme for SIM based devices/ Gateways developed in 2016 in TEC.
- Embedded SIM: It is based on GSMA specifications. It is in the form of IC and in solderable form factor, therefore temper proof & quite suitable for Automotive and industrial applications. It has been adopted in AIS 140/ IS 16833 standard for Vehicle Location Tracking services.
- IPv6 or dual stack for all devices/ gateways to be connected directly to PSTN/ PLMN. It has been mandated by BIS in IS 16444 (Smart electricity meter on cellular technology)
- Common service layer: adopted oneM2M standards.
- Spectrum for low power wireless communication technologies,
- Spectrum for C-V2X : spectrum in 5.9 GHz band allocated
- IoT Security etc.
- …..

TEC Initiatives in M2M/ IoT domain

- Adopted **oneM2M Release 2 / Release 3** as well as **3GPP Release** (10 to 16) Specifications as National Standards.
  - Bureau of Indian Standards (BIS) IoT Reference Architecture (RA) standard is having TEC National standards (oneM2M Rel 2) as normative and informative references.
  - Ministry of Housing and Urban Affairs (MoHUA) referred the BIS IoT RA - IS 18004 (Part 1): 2021 in its RFP and issued advisory to Smart Cities CEOs.
  - C-DOT developed oneM2M Rel 3 based platform and opened it for hosting of applications by various Start ups, innovators and industries.
  - CDAC developed oneM2M Rel 2 based platform and providing services.
  - IIIT Hyderabad is having oneM2M Rel 2 based Smart City living lab for R&D and created Smart campus network.
  - Some Smart Cities are also based on oneM2M Standards.

International recognition of TEC TR on M2M/ IoT

1. International Telecommunication Union (ITU) has posted the following six Technical Reports released in TEC on its website in IoT sections (2023, 2022 and 2021), recognizing as insightful technical resource for the benefit of global community (http s://www.itu.int/cities/dt-resource-hub/iot/)-

    a. Security by design for IoT device manufacturers
    b. Framework of National Trust Centre for M2M/IoT Devices and Applications
    c. IoT/ ICT Standards for Smart Cities
    d. Emerging Communication Technologies & Use Cases in IoT Domain
    e. Code of Practice for Securing Consumer Internet of Things (IoT)
    f. IoT/ ICT Enablement in Smart Village and Agriculture

2. TEC Technical report *Code of practice for securing consumer IoT* has been mentioned by several international organizations such as in IoTSF documents.

TEC Contributions in ITU-T SG-20 – approved as standard

- Besides working as an editor, significant contributions have been submitted in the following standards documents:
  - ITU-T Recommendation Y Suppl. 53 (12/2018) on IoT Use cases
  - ITU-T Recommendation Y Suppl. 56 (12/2019) on Smart City Use cases
  - ITU-T Recommendation Y. 4218 (05/2023) on IoT and ICT Requirements for deployment of Smart services in rural community.
- ITU-T SG-20 approved Indian proposal for Creation of SG-20 regional group for Asia Pacific [ITU-T SG20 RG AP] in its meeting held in Feb 2023 and also approved its chairmanship for India.
  - Its first meeting is scheduled on 25-26 July 2023 in virtual mode

TEC Contributions in ITU-T SG-20 – approved as standard

- Contributions being submitted from 2022 onwards in **ITU/ FAO Focus Group on 'Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture' (FG-AI4A),**

  a. *Applications of Drones, AI and IoT in Cashewnuts farming*

  b. *IoT based Farmland Surveillance System with Disease Detection in Paddy Crops*

  c. Artificial Intelligence-based Disease Identification in Wheat Crops

Use cases at (a) & (b) above are based on the projects carried out in VIT Chennai and (C) in ICAR Delhi.

All the three use cases have been approved by the Focus group and included in its document

- In 2022-23 contributions have also been submitted & presented in ITU-T SG-17 on "Security Controls for IoT Systems" and ITU-R WP 5D on "Vertical Industry applications".

M2M/ IoT rollout in progress: Important developments

- 4G connectivity is having around 99% footprint across the country.
- 5G rollout in progress. More than 0.27 Million base stations radiating 5G signals.
- 100 Smart Cities are being developed.
- Bharatnet project for connecting 0.25 Million Villages panchayats on OFC: 0.15 Million villages have already been connected on 100 Mbps OFC connectivity. It is being extended using Wi-Fi Hotspots. OFC connectivity is also being used as a backbone by Cellular / LPWAN service providers.
- More than 1000 M2M Service providers in the country.
- Semiconductor projects being developed.
- Around 1.14 Billion cellular connections and 0.85 billion internet users in the country.
- M2M/ IoT deployments in progress at a large scale in various verticals as well as in Smart cities/ Smart Villages.

TEC Initiatives on M2M/ IoT Secrity

- Technical reports released on IoT security
  - i. ***Security by design principles for IoT device manufacturers,*** released in March 2023
  - ii. ***Framework for National Trust Center for testing of M2M Devices and Applications***, released in March 2022.
  - iii. ***Code of practice for Securing Consumer IoT***, released in August 2021

TEC Initiatives on M2M/ IoT Secrity

- The technical report ***Code of practice for Securing Consumer IoT*** released in August 2021, provides baseline requirements for securing Consumer IoT. Guidelines available in this report, will be helpful in securing consumer IoT devices & ecosystem as well as managing vulnerabilities. This technical report is based on the guidelines available in ETSI TS 103 645/ ETSI EN 303645.

  This report has been endorsed to all related stakeholders to start following at least the first three guidelines i.e.

  (a). No universal default passwords.

  (b). Implement a means to manage reports of vulnerabilities and (c). Keep software updated

- The technical report on ***Framework of National Trust Centre (NTC) for M2M/ IoT Devices and Applications*** released in March 2022 visualizes the implementation of national trust centre in a phased manner for managing/ addressing the vulnerability related issues of the IoT devices reported by IoT/ Smart city platforms working in the network.

  This project is being developed.

- Technical Report ***Security by design for IoT Device Manufacturers*** released in March 2023, highlights various threats and challenges related to IoT device security; includes study of national/ international standards (by ITU, ISO/ IEC, ETSI, ENISA, IoTSF, NIST, GSMA, 3GPP etc.), best practices and guidelines (UK DCMS, CSA Singapore, WEF, STQC etc.) to mitigate these challenges. This report also provides recommendations for IoT device manufacturers and related stakeholders, which will help in securing IoT ecosystem.

  Recommendations are being included in the security requirements being developed for testing & certification of the products.

Proposed IoT devices classification for India

Proposal for Device Classification						
Security Features	**Security Requirements**	**Level-0**	**Level-1**	**Level-2**	**Level-3**	**Level-4**
Confidentiality	Message Encryption	X	√	√	√	√
	Attack Protection	X	X	√	√	√
	Data Encryption	X	√	√	√	√
	Tamper Resistance	X	X	√	√	√
	Security Assessment Certificates	X	X	√	√	√
	Device ID Management (Physical/ Logical)	√	√	√	√	√
Integrity	Data Integrity	X	X	√	√	√
	Platform Integrity	X	X	√	√	√
	Secure Booting and Integrity Test / Self Test	X	X	X	√	√
Availability	Logging	√	√	√	√	√
	External Attack Prevention & Response	X	X	X	√	√
	Secure Monitoring	X	X	X	√	√
	Secure Firmware Update & Patch Update	X	√	√	√	√
	Software Assets Protection & Response	X	X	√	√	√
	Vulnerability Management & Response	X	√	√	√	√
	Security Policy Update & Response	X	X	X	√	√
Authentication/ Authorization	Biometrics	X	X	X	X	√
	User Authentication	X	√	√	√	√
	Data Authentication	X	X	√	√	√
	Password Management	X	√	√	√	√
	Access Control	√	√	√	√	√
	Device ID Verification	X	X	√	√	√

Security Assement and standard	Level-0	Level-1	Level-2	Level-3	Level-4
Meet Baseline Security Requirement					
Adherence to cyber security based on International Standards					
Adherence to the principles of Security by Design, and absence of known common software vulnerabilities					
Resistance against common cyber-attack and undergo for penetration testing					

Way Forward

- Globally harmonized and interoperable standards are required to develop the sustainable IoT eco-system, as it will help in economies of scale and affordability

- Collaboration among the SDOs will avoid the duplication – liaisons to ISO/IEC JTC1 SC41, SC42, SC27 and other standardization bodies as the case may be.

THANKS

For detail, see the TR available on www.tec.gov.in/technical-reports/

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